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Dr. M. L. Kaufmann

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OAT PRODUCTION

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INTRODUCTION

The objective of this manual is to provide Alberta farmers with information that will help them achieve maximum net production returns from oats. Oats will not normally bring as great cash returns as canola, barley or wheat, yet on some farms, in some areas, they can provide a useful substitute for any of these other crops. If managed properly they will provide a good cash return and will form part of a good crop rotation. The information in this publication applies mainly to the central and northern areas of the province where most of the oats are produced. The use and handling of oats for grain, silage or dry fodder and pasture are considered. The variety picture keeps changing as new varieties become available. A description of currently grown and recommended varieties is included in the Appendix.

HISTORY

The time and place of origin of the common oat is not known. The best sources of information tell us that oats did not become of prime importance to man as early as wheat or barley. Production of oats in Canada spread along with agricultural settlements, and at one time production was second only to wheat in economic importance. They were the standard feed for horses and only with the advent of tractor power for farming did the significance of oats decrease. In 1943 there were over 3.5 million acres (1.4 million hectares) of oats sown in Alberta, and as late as 1962 there were over 2.5 million acres (1 million hectares) sown. The acreage has steadily declined over the last 10 years, and has levelled off at about 1.5 million acres (600,000 hectares). In comparison, Saskatchewan currently sows 1 million acres, and Manitoba sows 0.5 million acres.

The decline of the horse population has already been cited as one cause for the decline in oat production. There were other factors. In the 1940s and 1950s barley became the standard cereal concentrate for cattle and hogs, replacing oats. Barley is more widely adapted than oats because of its shattering resistance and drought tolerance, and will yield more energy per acre at a higher protein content than oats. During World War II, rapeseed, now canola, was introduced to western Canada and became a valuable alternative cash crop. Perhaps of lesser importance was the introduction of wild oat herbicides which could be used effectively in controlling wild oats in wheat, barley and canola, but not in oats, thus discouraging oat production on farms with wild oat problems.

The history of oat varieties is interesting. Victory was the leading variety in Alberta for many years, and there are still a few farmers growing it. Many farmers considered it the best variety for fodder, and the straw was considered superior by some. Harmon was developed and distributed in the mid-1960s and was the leading variety for about 20 years. Harmon was popular in Alberta mainly because of its plump kernel characteristic. Newer varieties are beginning to take over as continued improvements are made. At the present time, there are seven varieties listed by the Alberta Cereal and Oilseeds Advisory Committee that are grown on a significant number of acres, all of which have been developed after Harmon. In recent years oats have been developed and released for special purposes. Hinoat was released as an oat with a high level of protein; it was low in yield and never reached a production level of importance. Foothill was released as a forage oat, having done well on the Grey Wooded soils of Alberta where it is still grown to a limited extent. The standard high seed-yielding varieties are still the most popular in general. New varieties of hulless oats, such as Terra, have been developed in the last 10 years in the hope that they will satisfy the market as a feed for young animals, but they have not reached any degree of importance. Unfortunately the marketplace generally has failed to pay the premium required to replace the 20-25 per cent loss in weight (yield) resulting from the absence of a hull.

UTILIZATION

The major use of oats is for livestock feed, either in the form of grain, silage or dry fodder. A limited number of acres is sown for pasture as an emergency measure. Oat straw is used quite extensively as a roughage for cattle and as bedding for livestock. Oats are sometimes mixed with barley and sown for fodder. Mixing the two will extend the harvest period, oats being later maturing than barley. Oats are still used widely for human consumption. Major uses include breakfast cereal, oatmeal baked products and granola bars. For many people, oatmeal porridge continues to be the standard breakfast. They are also used as a companion crop for grasses and legumes when sown at half the regular seeding rate. Oats are used because they are considered less competitive than barley.

CURRENT MARKETS

Most of the oats produced in Alberta are used in the province. The most recent estimates indicate that about 20 per cent of the grain may be shipped to other parts of Canada or elsewhere. In 1984 over 13 million bushels (209,300 tonnes), valued at $30 million, were shipped out of Alberta. Most of the grain is marketed as No. 1

Feed. About 10 per cent is graded and marketed as No. 1 CW or 2 CW or Extra 1 Feed. The figures for western Canada are given in Table 1.

Table 1. Grade distribution of oats in western Canada, 1980-1982.

	1980	1981	1982
	Percentage		
1 CW and 2 CW	1.0	2.0	3.5
Extra 1 Feed	3.0	5.0	6.5
1 Feed	81.0	85.0	84.0
2 Feed and lower	15.0	7.0	7.0
Total	100.0	100.0	100.0

The milling industry prefers oats with a thin hull and kernels of near uniform size. For baby food, and in some instances, pet food, they prefer an oat with a high protein content. At one time the millers preferred oats with a low fat (oil) content, but in recent years they have discovered a means of controlling the agents causing rancidity in milled oat products, and oats with a high fat content are no longer a problem.

There is always a limited demand for oats with a bright and even-colored hull and a high bushel weight for horses. Although these factors have no real effect on quality or on the horse, they are preferred by some horsemen, and are nicknamed "pony oats". This specialized market can be quite lucrative if the grower cleans and bags the final product.

ADAPTATION

Oats are a widely adapted crop being grown on a very wide range of soil types and climatic conditions throughout the world. However, they require more moisture to produce a given unit of dry matter than any other cereal crop except rice, and are vulnerable to injury from hot dry weather, particularly from early heading through kernel production. Oats are not adapted to areas subject to high winds because of shattering. Like rye, oats are not as selective of soil type as other cereals. If temperature and moisture conditions are favorable, any reasonably fertile, well-drained, non-saline soil is suited to their culture. They are less tolerant of saline soils than barley or wheat (Figure 1), but they are more tolerant of acid soils (Table 2). Crop comparisons over a number of years have shown that barley varieties have yielded much better than oat varieties at Acme, northeast of Calgary, in the Dark Brown soil zone where moisture is a limiting factor, while oat varieties have yielded more than barley at Evansburg, to the west of Edmonton, on a Grey Wooded soil which is known to be acidic and where moisture is adequate. Oat production on irrigated land in southern Alberta is not very popular because of the poor lodging resistance of our current varieties, and the typical hot, windy weather of southern Alberta. Also, the economic return from oats on irrigated land is not usually competitive with that of traditional irrigated crops.

TABLE 2 — ACIDITY TOLERANCE OF VARIOUS CROPS

Alfalfa, sugar beets	6.5
Barley, red clover	6.0
Canola, wheat, corn	5.5
Potatoes, rye	5.0
Cranberries, oats	4.5

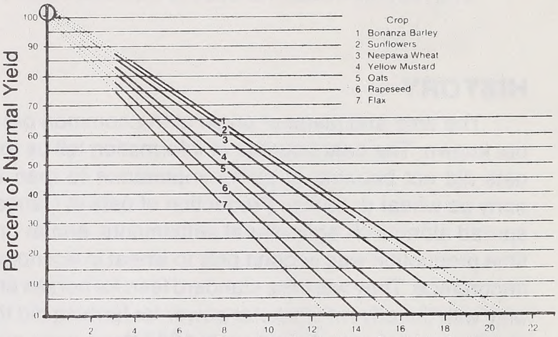

Figure 1. Yield response of various salinity levels of seven crops. The steeper the slope line the less tolerant the crop. Note: the solid portions of slope lines are known values. The dotted portions are projected values.

Oats lack tolerance to manganese deficiencies, and when sown on manganese deficient soils, the yields will be severely reduced by a physiological disease known as greyspeck. Soils low in manganese are usually associated with low-lying areas, soils high in organic matter or sandy soils.

In Alberta oats are grown primarily in Areas 3, 4 and 5 (Figure 2).

DISEASES

Many organisms can cause diseases in oats that result in production losses. In Alberta, diseases are not generally a serious problem. Loose and covered smuts are a problem in a few varieties some years. Symptoms of the disease are black spore masses which replace both the kernel and the hull. Grain to be used as seed from an infected crop should be treated with a fungicide such as Vitavax or Agrox NM to control this disease. Varieties like Dumont and Fiddler are resistant to the smuts. In the near future it will be mandatory for a variety to have resistance to smuts before being granted registration (a licence).

Grey speck is a disease caused by a shortage of manganese in the soil. Oats are more susceptible to this disease than any other cereal crop. To avoid this disease oats should not be sown on soils high in organic matter or on sandy soils.

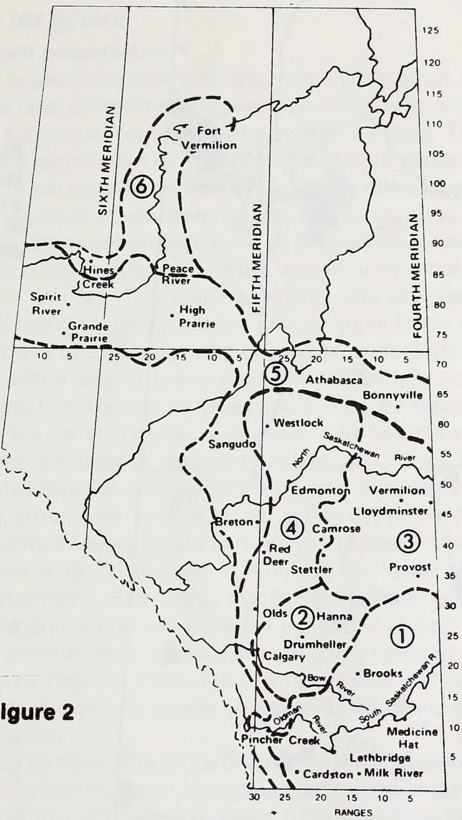

Figure 2

Blast is a disease that is not highly destructive, or commonly seen. There is very little known about the actual cause. Blast refers to a form of sterility which shows up at the time of heading in the form of white, empty glumes (kernels), usually near the base of the panicle (head). It is associated with extreme changes in growing conditions such as temperature, moisture, light or nutrition that occur between seeding and pollination. Late seeding tends to increase the amount of blast. There are no known control measures. If well adapted varieties are used, the losses in yield from blast will be minimal.

Fortunately the rust spores, which can cause severe losses in oats in eastern Canada and Manitoba, normally arrive in Alberta too late to be of any significance.

INSECTS

Cutworms

Red-backed and pale western cutworms may attack oats. They can be controlled by applications of insecticides with the trade names Lorsban, Decis or Ambush.

Wireworms

Wireworms may be a problem if oats are sown on freshly broken pasture or hay land. The worms will cut off the plant below ground level when it is in the one to two leaf stage. Seed treatment with Lindane prior to seeding on new breaking is recommended.

TIME TO MATURITY

Oats fall between wheat and barley in time to maturity. Although there is a wide range between varieties within each crop, generally speaking, the latest maturing oat varieties will mature as early as, or earlier than, the earliest maturing wheat varieties. Similarly, the latest maturing barley varieties will mature about as early as the earliest maturing oat varieties. The actual time in days required from seeding to maturity varies from season to season, and from location to location within seasons. In the main oat growing areas, the average growing season required for oats would be from 105 to 110 days. A map showing the average number of frost-free days in different parts of the province is given in Figure 3. Information from this figure should be used to help choose a crop or variety.

LAND SELECTION

Land used for oat production should:

- not be infested with wild oats
- not have been treated with wild oat herbicides such as Avadex or Treflan the previous fall or later. On heavy soils or following a season of light rainfall, oats should not be sown in the growing season following the year of application
- not be deficient in manganese
- not be saline
- not be very dry or subject to high winds.

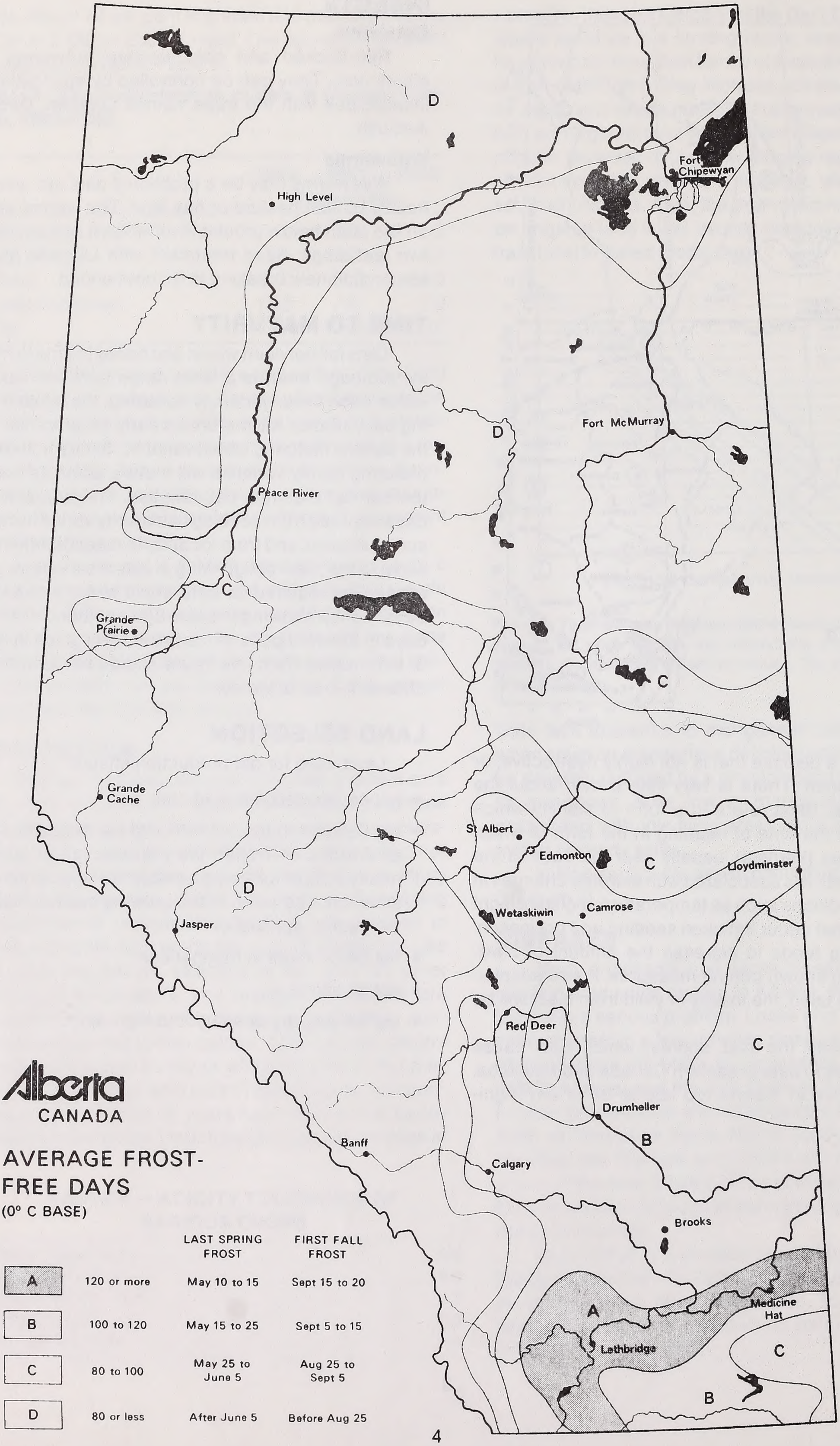

Figure 3
Map showing average number of frost free days in Alberta.

CULTURAL PRACTICES

Oats for grain:

Seedbed preparation

It is assumed that oats will normally be sown on stubble land, unless they are grown specifically for seed when summerfallow or breaking should be used. The seedbed preparation will not differ from that for barley or wheat. It will depend on location, soil type, season, soil moisture, trash cover, weed history and topography. If winter annuals are present such as stinkweeds, or perennials such as Canada thistle, weed control should begin in the fall. The important thing with fall weed control using tillage is to leave enough trash cover on the surface to minimize water or wind erosion. Surface tillage with a disc or heavy cultivator will usually do a good job. The land should be worked across the slope, if possible, to minimize erosion from water. In the absence of winter annuals or perennials in the fall, it may be better to leave the stubble as a snow trap, especially in prairie areas, and work it in the spring. At times the winter annual weeds present are best controlled through a fall herbicide application. Not only is this faster and less expensive than tilling, but it will facilitate snow trapping and almost eliminate the possibility of wind or water erosion, important considerations especially in the prairie regions. Remember that unworked soil with standing stubble will usually be slower to warm and dry in the spring.

Soil samples should be taken from the field before freeze-up and tested to determine the fertilizer requirements of the crop for the next year. If the tests show that nitrogen fertilizer is required, it may be applied in late fall or early spring. Oats respond to the various fertilizer application methods in a similar manner to other cereal crops. See *Alberta Fertilizer Guide*, Agdex 541-1.

Spring tillage should begin as soon as there are signs of weeds or volunteer grain growth. Again, a disc or cultivator will do an adequate job. A firm seedbed will help keep the soil from drying out. Therefore, it is important not to set the tillage equipment too deep and to follow the disc or cultivator with a packer or set of harrows. The soil is called firm when you can walk over the field and not sink deeper in the soil than the sole of your work boot.

Keep spring tillage to a minimum to preserve as much of the valuable surface soil moisture as possible. Soil moisture near the surface allows for shallow seeding and the associated benefits are discussed under 'Depth of seeding'.

No-till for oats

As the name implies, the soil is not tilled before seeding except for that which goes along with fertilizer application. Even though research with oats and no-till has been limited, it is probably safe to assume that the same principles and practices that apply to wheat and barley apply to oats. Weeds are controlled with selective herbicides, therefore, if there is a possibility of wild oat infestation, no-till should be avoided.

Soils under no-till culture are often cooler and remain wet longer than soils that have been tilled. Therefore, in areas where the growing season is short, no-till culture may not be suitable.

Nutrient requirements of oats

The amount of plant nutrients removed from the soil by oats or any other crop depends on the yield of the crop. The greater the yield, the greater the amount of nutrients removed.

Considering seed yields on a weight basis, whole plants of oats, wheat and barley remove similar combined quantities of nitrogen (N), phosphorus (P_2O_5), potassium (K_2O) and sulphur (S) from the soil (Table 3). If the straw is left on the field, oats remove less nitrogen and potassium but more sulphur than barley and wheat. The nutrient content of canola is much higher than for cereals, but comparisons should be made at yield levels obtained under field conditions.

TABLE 3— NUTRIENTS USED BY CROPS*
(kilogram per hectare)

Crop	Crop Part	N	P_2O_5	K_2O	S
Wheat	Seed	79	32	21	5
(3225 kg/ha or	Straw	32	7	64	8
48 bu/ac)	Total	111	39	85	13
Barley	Seed	65	24	22	5
(3225 kg/ha or	Straw	34	9	73	8
60 bu/ac)	Total	99	33	95	13
Oats	Seed	58	24	17	8
(3225 kg/ha or	Straw	40	15	70	10
84 bu/ac)	Total	98	39	87	18
Canola	Seed	120	57	29	21
(3225 kg/ha or	Straw	70	26	121	17
57 bu/ac)	Total	190	83	150	38

(To convert kg/ha into lb/ac, multiply by 0.89)

Soil tests and fertilizer recommendations

Many factors affect the amount of fertilizer that should be applied to a field in any given year. Applications of fertilizer should reflect the nutrient status of the field, soil moisture conditions, management practices, expected growing season precipitation and yield, fertilizer costs and current grain or fodder prices. Soil tests should be used to determine the nutrient status of fields. An agronomist can then use the soil test results, along with management information provided by the farmer, to recommend the kind and amount of fertilizer to be applied.

Soil samples should be taken annually and sent to a reputable laboratory. The available nitrogen content of soils can change rapidly, therefore, the nitrogen test is only valid for one cropping season. The available phosphorus and potassium content of soil changes more slowly, so these tests are useful for more than one cropping season.

Samples should be taken in the fall after October 1, when the soil temperature has dropped below 7°C, but before freeze-up. Samples can also be taken in the early spring, but there may be insufficient time to obtain soil test results and apply the required fertilizers prior to planting.

Fall is often a convenient time to apply fertilizer. Nitrogen should be banded in late fall after the soil temperature has dropped below 7°C. Both early fall banding applications and fall broadcast applications of nitrogen are often less effective than late fall banding. Spring application should be used on soils that are poorly drained and excessively wet in early spring.

Variety selection

There are several varieties of oats available (Appendix 1) and new ones will replace these in time. An attempt should be made to learn about these varieties in detail to determine which may be the most profitable in any given location. A yearly publication from Alberta Agriculture entitled, *Varieties of Cereal and Oilseed Crops for Alberta*, Agdex 100/32, gives comparative information on varieties by regions and will serve as a helpful guide to variety selection. There is a wide range in time to maturity, lodging resistance, kernel size and plumpness, yield potential and test weight, and these factors should be considered. Since there are no serious oat diseases in Alberta, disease resistance is not a major selection factor.

The purchase of pedigreed seed is recommended when changing varieties or every two to three years to renew your seed supply. Pedigreed seed ensures variety purity, good germination and a weed free standard. It is important to evaluate or test a new variety before you make a change. A small amount of seed may be purchased and sown on land free of wild oats, evaluated for at least two years, and if the evaluation is satisfactory, the new variety may be used on the entire oat acreage.

If it is planned to use seed from oats grown on your own farm, a germination test should be run first. A slight frost before the seed matures, or if the grain has weathered in the swath, can reduce germination considerably. Oats are more sensitive to injury which can cause germination problems than wheat or barley. The seeding rate may be adjusted according to the results of the germination test. However, if the germination is less than 65 per cent, it would be better to purchase new seed, as poorly germinating seed is usually unthrifty and possibly diseased.

Seed treatment

- If the seed is known to be contaminated with smut spores, treat with a fungicide.
- If seed is to be sown on freshly broken pasture or hay land, treat it with an insecticide to prevent possible wireworm damage.
- Many producers feel that it is good insurance to seed treat every year considering the small cost and potential benefits.
- Oats need not be seed treated when none of the above conditions apply.

Time of seeding

Oats can be sown as soon as the land can be prepared in the spring. Optimum yields are usually obtained from early seedings. However, the same is true for wheat and barley. Barley should be sown first if the crop is intended for the malt market, and wheat and Argentine canola should be given priority when the growing season versus days to maturity requirements are tight. In planning the whole seeding operation, consideration should be given to the time required to mature the variety you have chosen. There is a range of almost two weeks in the maturity dates of oat varieties presently available in Alberta.

In the main oat producing areas of central and northern Alberta, it is recommended that oats be sown by May 20, and when the crop is intended for grain, not later than the end of May. Figure 3 shows that later seeding may lead to fall frost damage.

Although there are no results available as to the time of seeding of the different varieties versus yield, it is assumed that, even in the absence of fall frost, early maturing varieties would respond better to late seeding than varieties requiring a longer time to mature. This assumption is based on the fact that the oat plant is a cool season plant, and the more it has developed before the heat of the summer, the better the chance it has to yield well.

The temperature of the soil after May 1 is becoming a popular guide to help decide when to seed. Two readings should be averaged to determine soil temperature, one taken in the early morning, about 8:30 a.m., the other at mid-day, about 4:30 p.m. Temperatures are taken at seeding depth (Table 4).

Table 4: Germination temperatures for field crops.

Crop Kind	Minimum (°)	Preferred (°)
Wheat	4	20
Barley	3-5	20
Oats	5	20-24
Canola: Argentine	5	15-20
Polish	7	15-20

Seeding equipment

Oats may be sown with the same equipment used for barley or wheat. The type of furrow opener will depend on soil type and trash cover. The main objectives are to get the seeds distributed evenly down to moisture, with good seed-soil contact in a firm seedbed.

Depth of seeding

Oats should be sown as shallow as possible to get the seed down to moist soil. Oats are less sensitive to deep seeding than barley, but for best emergence, they should not be sown deeper than 2.0 inches (5.0 cm). Shallow seeding results in better and quicker emergence which in turn will result in earlier maturity and increased yields. In lighter textured soils, a 3.0 inch (7.5 cm) depth may be used without serious consequences. In heavier textured soils, reduced emergence and less vigorous seedlings will result from a 3.0 inch seeding depth. Therefore, if it is necessary to seed deeper than 3.0 inches to get down to moist soil, it may be better to seed 2 inches deep and hope for rain, or irrigate.

Rate of seeding

There is a tendency to seed heavier than necessary to obtain optimum production. The optimum seeding rate depends on area of production and on the variety being sown. Areas of light rainfall should be sown at lower rates than areas of heavier rainfall. In the Black and Grey soil zones 60 lb/ac (70 kg/ha) should be adequate, while in the Brown soil zone a rate of about 50 lb/ac (55 kg/ha) should give the best results. (Oats = 34 lb/bu).

When starting with a new variety for which the seed is scarce and a seed increase is of prime importance, a much reduced seeding rate is advisable. A rate of 25 lb/ac (28 kg/ha) to 35 lb/ac (40 kg/ha) should give an optimum seed increase (not yield).

The seed size of the variety and the germination of the variety should be taken into consideration when deciding on seeding rate. The smaller the seed, the lighter the seeding rate and vice versa. The rate of seeding should also be adjusted to compensate for poor germination of the seed consistent with the precautions discussed under 'Variety selection'.

It should be kept in mind that lighter seeding rates will produce a crop requiring a little more time to mature, having a little more resistance to lodging, and being a little taller than if it were sown at a heavier seeding rate. The extent to which these changes occur depends on seasonal growing conditions.

Weed control in oats

Controlling weeds is an everlasting activity and must be considered in all farm planning and in every phase of the farm operation. It is important to keep weeds under control because they can cause serious yield losses. Weeds take moisture and nutrients that would otherwise be available for the oat crop. The yield losses incurred by the misuse of these nutrients and moisture are proportional to the weed population. If there are weeds in your field, it is important to kill them as soon as possible to reduce the losses. It is even more important to keep new species of weeds from coming onto your farm, and to keep weeds on your farm from moving from one field to another.

Therefore:

- Use seed that is as weed-free as possible. When purchasing new seed ask for the Certificate of Analysis which names the weed seeds present. Seed containing weed seeds you do not have on your farmland should not be used.
- Avoid transporting weeds from one field to another with machinery, animals or manure.
- Control movement of water from weedy to weed-free areas if possible.
- Spray with an appropriate herbicide to control emerging weeds.

Persistent weeds can be controlled by:

- using crop rotations that include perennial forages, fall-sown crops, or fallow
- harvesting early for silage or greenfeed before the weeds mature
- spot spraying with the appropriate specialized herbicide.

The best control usually results from a combination of the above methods.

Broadleaf weed control in oats is achieved using most of the same herbicides (but not 2,4-D) used on wheat and barley fields. It is important to identify the weed species present so the proper herbicide selection can be made. The most notable exception is wild oat control. At the present time the herbicides available for wild oat control will also kill the oat crop. Many farmers give this as the main reason for not growing oats. Wild oat control is very important for those who plan to stay in the business of tame oat production. Complete herbicide information can be obtained from *Guide to Crop Protection in Alberta*, Agdex 606-1.

Harvesting oats

Oats are subject to shattering and therefore should be swathed and picked up rather than straight combined. Oats may be swathed for feed when the kernel moisture content is about 35 per cent without loss in yield or protein content. However, the number of green kernels at this high moisture percentage will likely prevent the oats from grading 1 CW. For top milling grade (CW), swathing should be delayed until the crop reaches 20 per cent moisture or less. Kernel moisture should be determined by using a reliable moisture meter on samples of grain taken from the whole field. Kernels with around 35 per cent moisture will be in the soft dough stage. If you remove the hull they can be flattened by squeezing between the thumbnail and forefinger but no free moisture will be forced from the groat (dough). If the kernel has a permanent crease left from squeezing it between your thumbnail and forefinger, but is not cut through, then it has a moisture content of about 31 per cent.

Harvesting oats too early will result in some loss in grain yield and quality, but this will be compensated for to some degree by having a more palatable straw for roughage. Leaving the crop stand too long will likely result in shattering losses.

Straw quality

The variation in straw feed quality between oat varieties is insignificant and should not be used as a variety selection criterion. The average feed values are: protein - 4 per cent, fibre - 49 per cent, calcium - 0.27 per cent, and phosphorus - 0.08 per cent.

Storage

According to grain handlers, oats are more subject to spoilage in storage than wheat or barley. The moisture content must be down to 14 per cent before oats can be stored safely. With the moisture content down to this level, and without green weed seeds and plant parts, storage should be no problem.

Oats for fodder

Oats are often sown to provide fodder in the form of silage or greenfeed. Except for barley in the southern part of the province, oats will yield more silage or greenfeed per unit area than any other cereal crop. If managed properly, it can provide 3-4.5 tons of dry matter per acre, or more, of high quality feed containing up to 10 per cent protein. Many years of comparing yields of oats with barley have shown oats to be superior in the Black and Grey Wooded soil zones. Although the per cent protein level in barley is higher than in oats, the total amount of protein produced on a given area is higher with oats than with barley. Oats have about 22-26 per cent hull whereas barley averages about 12-14 per cent hull on a weight basis.

Variety selection

There are many factors to consider when choosing an oat variety for use as silage or greenfeed. Farmers in different areas, and even in the same area, will choose different varieties. Until recently not much was known about the performance of oat varieties compared with one another or compared with varieties of other crops. Much information has been gathered over the past several years on the forage yields, and protein and fibre levels on oat varieties at several locations in central and southern Alberta. On the basis of this information, a recommended list of varieties is presented in *Varieties of Annual Forage Crops for Alberta*, Agdex 120/32-1. These recommendations do not take into consideration the availability of seed, a factor that must be considered when choosing a variety. Some varieties have been developed for production in other parts of Canada, and a seed supply is not readily available in Alberta. When choosing a variety, the seed yield as well as the forage yield should be considered, thereby keeping one's options open to harvest as forage or grain. On heavier soils and in the more moist areas, lodging resistance should be considered. The variety Foothill yields well but lacks lodging resistance. Maturity is a consideration in areas where the season is short or where there is a possibility of conflicting harvest dates.

It is believed by some farmers that one variety might be better than another because it appears leafier; however, tests on a number of varieties have shown very little variation in leafiness.

The variety picture will keep changing and it is recommended that you consult with a forage specialist before choosing a variety.

Land selection

If the crop is intended for silage, the field chosen should be as close to a silo as possible. This way transportation costs, which can be high, will be kept to a minimum. If the crop is intended for green feed, it should be grown on land close to an area that is suitable for the storage of bales, and as close to the feeding area as possible. Avoid seeding on land that has saline patches, is deficient in manganese, or is infested with wild oats. Land infested with wild oats may not be a severe problem if one knows that harvest will occur prior to seed drop by the wild oats, such as in early silage or green feed harvest.

Seed treatment

Unless it is known that the seed you are to use carries smut, there is no need to treat the seed with a fungicide. If sown on land where wireworms may be a problem, like freshly broken land, the seed should be treated with an insecticide such as Lindane.

Time of seeding

Mid-May is the best time to seed oats for forage to obtain optimum yields in most areas of the province. From the standpoint of crop values, seeding of oats for forage should not be given priority over the seeding of canola, barley or wheat. In any event, it should be done as quickly as possible after the land has been worked. The potential harvest date must be considered. The weed situation could dictate when the seeding is to be done. It may be advisable to delay the seeding if there is a chance of lessening a wild oat problem by a later tillage operation. However, one must keep in mind that delayed seeding will likely cost in terms of lower yield.

Depth of seeding

The best depth for seeding forage oats is about 2 inches (5 cm), the same as for grain oats. Oats will tolerate a seeding depth of 3 inches (7.5 cm) if it is necessary to seed that deep to get down to adequate moisture. If the moisture level is below 3 inches, it may be best to seed to a depth of 2 inches and hope for rain.

Rate of seeding

Seeding rates will not have a great influence on forage yields and the influence will depend on the season. In some seasons fields with higher rates of seeding will yield more than fields planted at lower rates, while in a drier season the reverse may be true. The rate of seeding does have an effect on plant development and tillering. Higher rates of seeding result in decreased stem diameter, a shorter stem and less tillering. The seeding rate has little effect on the proportion of the plant parts, such as leaf, stem and seed, and hence the quality of the feed is not altered. Yield and quality considered, a rate of 70 lb/ac (78 kg/ha) should be about optimum in the Parkland and Peace River regions. In the drier prairie areas 50 lb/ac (56 kg/ha) is adequate.

Weed control

Weeds should be kept to a minimum in oats to be harvested for fodder. Weeds in the crop may influence the quality and palatability of the forage. The same control measures can be used in fodder oats as are used to control weeds in oats intended to be harvested as grain, except that seeding may be delayed longer to accommodate a later weed killing tillage operation, or the crop may be harvested earlier to prevent weeds such as wild oats from shattering. What would be lost in forage yield by an early harvest could be compensated for by reducing the future wild oat problem. Herbicide labels should be read completely, paying particular attention to any possible grazing or feeding restrictions.

Harvesting whole plant silage

For a combination of good forage yield and quality, harvesting should begin when the kernels are well filled and in the soft dough stage. When harvested at this stage, the silage should contain a high level of energy and protein, and it will be in the optimum condition for storage. At this stage the whole-plant average moisture content should be about 65 per cent, which usually occurs four to six weeks after heading (see Figures 5 and 6). Adequate packing of silage becomes very difficult when the moisture content is low. In addition, if there are wild oats in the field, it is important to consider harvesting before they begin to shatter. However, if you swath before the moisture is down to 70 per cent, you should leave the silage to wilt until the moisture is down to 65-70 per cent before you chop and ensile. Silage has been successfully made between 55 and 70 per cent moisture, the optimum being 65 per cent.

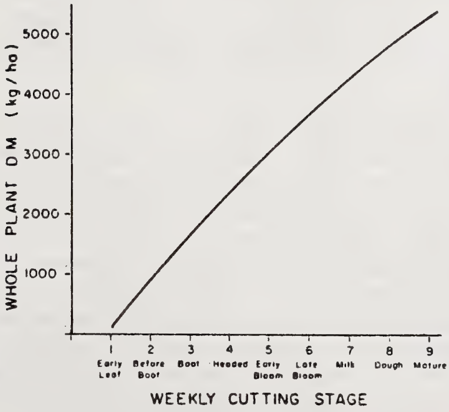

Figure 4: Dry matter yield at progressive stages of oat development. Source — Agriculture Canada, Swift Current.

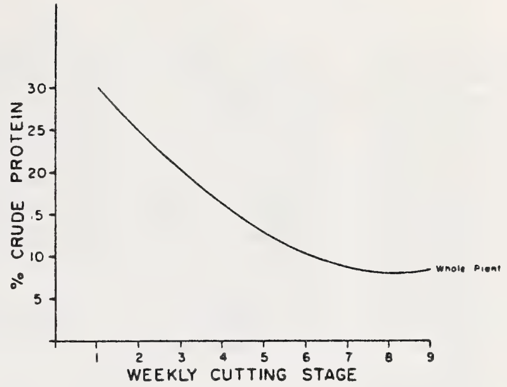

Figure 5: Crude protein at progressive stages of oat development. Source — Agriculture Canada, Swift Current.

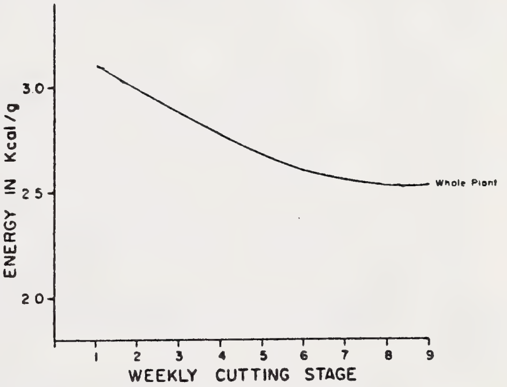

Figure 6: Energy value of oats at progressive stages of development.

An ordinary swather is suitable for silage swathing. To obtain optimum yields the swather should be set as low as possible but high enough to avoid stones and leaving enough stubble so that the swath can be picked up. The chopper blades on the forage harvester should be kept sharpened for best results.

Once harvested the silage should be ensiled immediately. It is most important to pack the plant material to exclude air. If stored in a bunker silo a wheeled tractor is more effective than a tracked vehicle for packing. As soon as the bunker silo is filled it should be covered completely with a polyethylene tarp to avoid spoilage. The polyethylene tarp must be kept from flapping in the wind, as this acts like a fan on the silage. Covering the poly with old or new silage works well.

Harvesting dry fodder

The time to swath green feed is the same as that for silage (60% whole plant moisture = soft dough stage).

The decision to harvest as silage or greenfeed can be left until after the field is swathed. When harvesting for greenfeed, the swath should lie in the field until it is dried down to about 12 per cent moisture or less. At this stage the crop can be baled and stored immediately. To ensure a palatable fodder with good quality, the bales should be stored as quickly as possible. An alternative to drying down to 12 per cent is to bale it at 20-30 per cent moisture and use anhydrous ammonia at a preservative. This procedure increases the protein content, the palatability, and reduces the risk of crop loss by shortening the field dry-down wait period.

Frost damage

Fall frost damage can be avoided most years in Alberta by seeding oats early (May 1 -15). In areas with a short growing season, the risk of fall frost damage can be further reduced by seeding early-maturing varieties like Jasper and Athabasca.

Late April and early May seeding will occasionally expose the young seedlings to freezing temperatures. However, oats can withstand quite a low temperature while still in this vegetative stage. Damage will depend on intensity and duration of the freezing period, but a temperature of around -6°C is required to kill the leaves of seedlings. Early May temperatures are rarely this low, and, even when the young leaves are damaged, recovery is usually complete because the growing point is protected from frost damage by being below the soil surface.

By the onset of flowering, a frost of 0°C to -2°C is sufficient to damage the young florets and result in partial, or even complete, sterility in the head. Early seeding or the use of early maturing varieties will not prevent damage from such very late spring frosts, but these late spring frosts happen so rarely that they should not deter one from seeding early.

Oats are most frequently damaged by fall frost when the crop is filling or maturing. The leaves will have regained a fair degree of frost tolerance by this stage (-7°C), but the developing kernels are easily harmed. The crop may therefore appear unharmed by a frost, yet the kernels have been killed and no further kernel development occurs. Yield loss depends directly on the stage of filling, with losses decreasing with advancing maturity.

When an oat crop has filled but has not yet dried and ripened, there will be no obvious seed damage from a killing frost. There is little or no effect on yield, and the kernels appear nearly normal. However, frozen grain will **not** germinate and is useless for seed. Always have a germination test done on grain destined for seed if you have any suspicion that a frost has occurred. Oats appear to be even more sensitive to frost-germination damage than wheat or barley.

Nitrate poisoning

Nitrate poisoning of livestock can occur if whole oat plants are harvested after having been subjected to a severe stress. The risk is increased if the soil is high in plant-available nitrogen. If the crop has been grown under extreme drought stress, or if a frost or hail has occurred before harvest, a sample should be submitted to test the nitrate level before feeding to livestock. Feed that tests high in nitrates can be diluted to safe levels by mixing with feed low in nitrates. A level of 0.5 per cent nitrate in a feed is potentially dangerous; 0.75 per cent will reduce milk production, and 1.5 per cent is usually lethal.

Oats for pasture

Oats will provide a suitable annual pasture in an emergency. When sown for pasture you should seed about six weeks to two months before you intend to pasture, depending on location and time of season. Grazing should not begin until the plants have reached 15-20 inches (35-50 cm) in height. However, an earlier start to grazing will still provide a good pasture, and depending on the moisture received, the regrowth from earlier grazing may actually be better. Oats generally have better regrowth potential than wheat or barley, but less than winter wheat, fall rye or Italian rye grass. The best oat yields will be obtained from early seedings (May 15), but fair grazing can be expected from seedings as late as mid-July. Annual pasture management can be improved by installing temporary electric cross-fencing.

SPECIAL USES FOR OATS

Oats are often used as a filler in fields with low lying areas that are too wet to seed when the main crop is sown. After the land has dried, these wet spots are worked and oats are sown for fodder or, if the season is long enough, the oats are harvested for grain. Normal practices are used in the handling of the crop, except for weed control. The oats in the low lying areas are not as far advanced as the crop in the rest of the field, so usually these areas are by-passed with the herbicide sprayer.

Oats are frequently sown as a companion crop in the establishment of grasses and legumes. Oats are less competitive than barley, and are therefore more suitable for this purpose. Oats should be sown at only half the normal rate when sown as a companion crop, and should be sown before the smaller seeded grasses and legumes. Limit the nitrogen applied so that the total available does not exceed 30-40 lb/ac. Higher nitrogen levels will cause excessive stress, through heavy oat growth, on the grass or legume being established. Harvest the oats for fodder as early as possible to further assist the grasses or legume establishment. The advantages of a companion crop are that it renders an economic return the first year of seeding a forage and provides some weed control through plant competition. The disadvantage is that, because of competition, the forage crop may not get as well established in the first year as it would if it were sown alone.

Before seeding a companion crop you should consult your local district agriculturist or forage specialist for recommendations specific to your area.

APPENDIX

OAT VARIETIES

New varieties are being licensed at a rapid rate and those best for your farm will change from time to time. At present there are nine cultivars described by the Alberta Cereal and Oilseeds Advisory Committee in Agdex 100/32, *Varieties of Cereals and Oilseed Crops for Alberta*, which is published annually in February.

Athabasca — was developed at the Agriculture Canada Research Station at Lacombe in 1977. It is an early maturing variety with a good yield potential, except in the extreme southern and extreme northern parts of the province. It has good lodging resistance. It has been grown mainly in west-central and northern Alberta.

Calibre — a thin hulled oat variety (22-23%). It was developed at the University of Saskatchewan and released in 1982. It is a late maturing variety which outyields Cascade in the southern part of the province, but does not yield as well as Cascade in the central and northern areas. It has good lodging resistance. To date Calibre has not become established in Alberta.

Cascade — the highest yielding variety grown in Alberta at the present time, is a little earlier maturing than Calibre. It has good lodging resistance. Cascade was by far the most popular variety in Alberta in 1985, being grown on nearly 40 per cent of the oat acreage. It was developed at the Agriculture Canada Research Station at Lacombe and released in 1979.

Dumont — was developed at the Agriculture Canada Research Station, Winnipeg, Manitoba and released in 1982. It appears best adapted to the eastern prairies, where good rust resistance is needed and late maturity is not as critical. Dumont has good test weight, fairly low hull percentage, and high percentage of plump kernels.

Foothill — was developed at the Ottawa Research Station and released in 1978. It was intended as a forage variety, especially in the foothills area of Alberta. It is a late maturing variety with only fair lodging resistance. The forage yields excel on the Grey-Wooded soils in Alberta but not elsewhere.

Grizzly — was developed at the University of Alberta in 1967. It is a late maturing variety with only fair lodging resistance. It does not yield as well as Cascade or Calibre. It has a plump kernel with a relatively high hull percentage (25-26%). Many producers prefer this variety for greenfeed. It has increased in popularity over the years, and in 1985 was grown on an estimated 20 per cent of the oat acreage in Alberta.

Harmon — was developed at the Agriculture Canada Research Station at Winnipeg, Manitoba and released in 1965. It was for many years by far the most popular variety in western Canada. It was never a top yielder in Alberta, but was presumably preferred because of its plump kernel. Harmon has good lodging resistance and is classified as a medium-late variety. It is now grown on about 16 per cent of the oat acreage in Alberta, having given way to Cascade and Grizzly in recent years.

Jasper — was developed at the Agriculture Canada Research Station at Lacombe and licensed in 1985. An early maturing variety, it yields more than any variety in its maturity class. It is similar to Athabasca in maturity, but outyields Athabasca by about 10 per cent. It does not have a large kernel but the hull percentage is low and the bushel weight is high. When seed is available, it should replace Athabasca wherever early maturity is an important consideration.

Random — was developed at the Agriculture Canada Research Station at Lacombe and licensed in 1971. Historically, it was the first variety of any crop to be developed using the single-seed descent method of breeding. It has shorter straw than other standard varieties, and has good lodging resistance. It yields slightly more than Harmon and is slightly earlier than Harmon. It should be considered where excessive straw is troublesome. At the present time it is grown on about 7-10 per cent of the oat acreage. It is more popular in west-central Alberta than in other areas.

Others

Varieties mentioned in other bulletins or in newspapers are not described here because they have no advantages when grown in Alberta. We can no doubt count on new improved varieties in the future.

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